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Star's Name.		R.A. 1900.	N.P.D. 1900.	Position Angle.	Distance.	No. of Nights.	Mags.		Epoch 1903.	Obs.
		h m	° ′	°	″					
β 858	A.B.	23 36	58 0	252·3	0·92	1	7·7	8·2	·950	L.
				256·2	0·57	1	...		·953	W.B.
β 389	A.C.	...	...	255·4	23·37	1	7·7	10·8	·950	L.
A.G.C. 14	...	23 39	61 12	193·8	1·81	2	5·0	9·5	·926	W.B.
				195·4	1·67	1	...		·950	L.
Barnard	...	23 42	85 19	171·3	0·54	1	8·6	8·6	·846	B.
Σ 3050	...	23 54	56 0	215·5	2·46	3	6·0	6·0	·893	L.
				216·4	2·30	1	...		·827	H.F.
				215·1	2·25	3	...		·932	W.B.
Σ 3056	A.B.	23 59	56 17	156·3	0·50	1	7·4	7·4	·824	L.
				152·6	0·66	3	...		·922	W.B.
	A.C.	...	...	357·4	22·71	1	7·4	9·0	·824	L.
	$\frac{\text{A.B.}}{2}$C.	...	...	359·7	22·50	1	7·4	9·0	·739	L.

Report on the Work of the Argentine National Observatory, 1904.

By the Director, John M. Thome.

(*Communicated by the Astronomer Royal.*)

In the twelve months ending with March, after deducting the losses occasioned by the Moon and unfavourable weather, there remained 93 nights, long and short, available for photographic and Durchmusterung work; for general meridian work, in which a moonless and cloudless sky is not essential, 180 nights were recorded.

During this limited period every effort was made to secure the maximum of results, and we obtained 298 plates, 108 of which were for the atlas and contained three exposures of thirty minutes', or longer, duration, according to the steadiness of the images and the transparency of the atmosphere at the time. Long-exposure plates are taken whenever the time disposable and the atmospheric conditions warrant the risk.

Both the Repsold-Gill and the Gautier machines have been in constant use, and we have measured the coordinates of 34,100 stars, in both positions of the plates, with an approximation to thousandths of a millimetre; and also the diameters of the images, according to Gill's method. Over two-thirds of these measures correspond to the Gill machine. Two observers take part in the measurement of every plate, reading alternate 5′ zones; each observer, again, measuring the same 5′ zone when the plate is reversed. The images of the reference stars, which have been previously marked upon the plate, are read by both observers. Nine hours, including an interval of two hours at noon, represent a day's work.

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Observing alone, as heretofore, I have added 65,000 positions to those already recorded in the Dm. Zone 52°–62°, and with these the observing is essentially finished. This brings the total number of determinations of position closely up to 400,000, representing about 138,000 stars. The revision of these results, especially with regard to the magnitudes, is finished for something more than one-third of the region; and, if the weather will permit, I shall finish everything by the end of the year. My original intention was to give estimates for all the Cape stars not observed here, but I soon found that that would not be possible in the Milky Way, where the lowest limit extends beyond $11\frac{1}{2}$, and the objects are too numerous and would require too much time to classify. As already stated, the Cape invariably leads in the galactic region, but in the non-galactic Cordoba has many more stars. The Cordoba scale is essentially the same in both regions, but the photographic exposures would seem either to have been somewhat longer, or the plates were more sensitive, in the crowded regions, since the corresponding lower limits differ by more than one and a half magnitude.

There is also in preparation an atlas for this belt. Something more than half the work has already been accomplished, and I hope that by the end of March the entire 280,000 stars will have been plotted. In the crowded regions of the Milky Way additional maps, drawn to twice the original scale, have been added, and the entire work has been under my constant supervision, which was not the case with the first atlas.

The registering micrometer, with clock-work attachment, arrived at the beginning of January, and after a few modifications could be made in the arrangement for fastening it to the tube, practice work was at once begun. The method has two decided advantages over the old one. The relative speed that must be given to the movable thread to make it coincide, or very nearly, with that of a star at any declination can be indicated in advance upon a scale, and a careful observer will soon be able to control the rate, so as to assure exact bisections of the images, which will then give accordant determinations of the clock error from both time and circumpolar stars. The second advantage lies in the fact that the observer is not conscious of the instants of transit, as in the old method, and is, therefore, not subjected to the recurrent strains, or shocks, at those critical moments; the strain is a uniform one throughout, and the attention of the observer is exclusively given to the bisection.

The value of a revolution of the screw is $4^{s}\cdot655$ in equatorial interval, and there are ten contacts recorded, automatically, in a revolution. Consequently it was necessary to use the two-pen system, in order to guard against confusion and to assure accurate readings of the contacts. Our Hipp chronograph carries two pens, but both its record and that of the Bond chronograph, which we have used ever since commencing Gould's zones, have a lineal length of only eight millimetres between second breaks,

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which is not sufficient to ensure readings accurate to the hundredth-part of an interval. Fortunately our clockmaker was able to give a speed to the barrel corresponding to twice that interval, or sixteen millimetres to a second, which is sufficient for all purposes. The Hipp chronograph enables one also to detect any error in the alignment of the pens at any moment by simply moving the carriage laterally and noting the trace or traces.

The illumination of the reticule and microscopes of our meridian circle had always been unsatisfactory; at times the transits being noted with difficulty, until we tried a lamp in which the illuminant is vapour of carburetted alcohol impinging on a gauze wick. This was still not entirely satisfactory for the microscopes, the illuminating mirrors for which had become tarnished, and I then decided to fix a small electric lamp, enclosed in a wooden box with an opening in the side directly facing the reflecting surface of each microscope, and this arrangement has given perfect satisfaction. The lamps are operated by the ordinary key, and are employed only during the few moments required in reading the microscopes. With the enlargement, besides, of the meridian room to four times its original length, of which I gave an account in my former report, provided throughout with sliding shutters and doors which can be opened in sections, or altogether, so as to maintain a proper ventilation and a uniform temperature with the outside air, everything has been done that I can think of to increase the accuracy of the results from this notable instrument, which has probably furnished a larger number of stellar positions (over 400,000 in both coordinates) than any other meridian circle in the world. It has suffered no injury during the thirty-two years that I have known it, except the unavoidable friction on the pivots, which has been guaranteed against by counterpoises as much as possible.

Under the original conditions indicated (of instrument and observing-room) the reobservations of the Dm. stars to 9·3 between 22° and 37°, giving nearly 156,000 positions, have been made, excepting that the heat escaping from the tube of the illuminating lamp was carried out of the room by a pipe with a funnel-shaped mouth, which is fixed directly above the lamp in a niche in the wall, and that the meridian shutters in the north and south walls of the room remained open, full or half-length, as the conditions—wind, dust, &c.—during the course of work permitted.

The method followed in these observations is not as complete and accurate as when all four microscopes are used, and to obtain the best results two observers and two microscope-readers, carefully trained and in hearty sympathy with the work, should perform the whole, alternating nightly. That condition I have found it impossible to maintain here.

This great mass of results obtained from the collaboration of many observers requires great care and much time in the treatment, and so long as there remain any errors to be detected

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in the records, or the methods employed may be varied to bring about more accordant and homogeneous results, I see no good reason for advancing their publication. The delay in the various processes is occasioned entirely by the difficulty in finding reliable and competent assistance, and my best men are getting old and are falling off. In spite of every precaution which I had taken to secure accuracy in the constants of reduction the determination of many of them turned out to have been carelessly made, which has compelled a repetition of large pieces of the original computations. The final results of observation (after a careful revision of all the processes) of Auwers's fundamental stars have been sent to him, and in quality are equal to anything published here.

In the Report of the Committee on Southern and Solar Observatories, published by the Carnegie Institution, the statement is made that "a strong National Observatory was organised at Cordoba in 1870, under the direction of Dr. B. A. Gould, which ranked among the leading observatories of the world for many years; but the financial disasters of Argentina have had a depressing effect upon that observatory," &c.

As this statement might seem to the uninformed to imply that the present administration has not been as alert as the first, I ask leave to state here the exact facts in our case.

When Dr. Gould resigned, in 1885, the observatory staff was, in effect, disbanded. I, who had accompanied Dr. Gould from the beginning, was promoted to the Directorship, Mr. Davis was appointed Director of the Meteorological Office, and Mr. Stevens, the third member of the last staff, was dead. There remained Mr. Tucker, lately arrived, whose time was soon entirely taken up with the affairs of the Dm.; and Mr. Jefferson, a young man who had not had any previous practice in meridian work and could not begin it here until after I assumed the direction, was the only one available for that work. The meridian observations began, therefore, under these depressing circumstances, which were aggravated by the rapid approach of the disastrous financial crisis, complicated by the boundary question with Chile, from which we are just emerging; and my efforts to increase the staff by engaging men abroad upon a paper basis were without permanent result.

Upon the retirement of Dr. Gould I offered to revise and publish the annual catalogues, commencing with 1874—eight volumes—and also to revise and compare the proofs of the *General Catalogue* with the originals here. This revision was a most thorough and exhaustive one, and the entire force at my disposal was engaged upon it, with the result that we were able to detect several hundred important errors. The annual catalogues were subjected to a similar scrutiny, and no one else could have, nor probably would have, given them this preferential attention. The last volume, No. xv., was published in 1896, and I extract the following passage from the preface, since it

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seems necessary to again call attention to it. See also the preface to vol. xiii. p. 13.

"The publication of these annual catalogues, beginning with 1874, has occupied a large part of our time, and has been a very considerable drain upon our steadily diminishing resources. The effort to maintain the activity and honourable record of the institution under the smaller salaries consequent upon a vanishing budget, which cut off from me all hope of obtaining trustworthy help abroad, has been attended with painful experiences, and I have repeatedly been compelled to stop and train new men, and to repeat operations performed by inefficient, negligent, or designing assistants."

And in the introduction to vol. xviii., published in 1900 March 15, I stated that the observations were completed in 1897, but that the Minister of Public Instruction had considered it necessary, in view of the possibility of a war over the Chilian boundary question, to reduce by two-thirds our already minimum appropriation, and that I had only recently succeeded in having the original appropriation restored.

At the time I was appointed to the directorship the value of the gold dollar was 0·82 cent; from then until 1889 the average value was 0·72; from 1889 to 1897 this was 0·34, being at one time as low as 0·22, and averaging only 0·28 from 1891 to 1895. For the whole period from March 1885 to the end of 1900 the average was 0·41, and it is now fixed at 0·44. We have always been paid in paper!

During the first administration there were published the *Uranometria Argentina*, the *Zone Catalogue*, and the *General Catalogue*. The observing books show that there was an average of 270 working nights per year during this period, and that the number of stellar positions determined was as follows:—

For the *Zone Catalogue* . .	105,252	observations.
" " *General Catalogue* .	160,506	"
Total . . .	265,758	"

During the present administration there have been produced four volumes of the *Cordoba Dm.*, with a total of 630,000 stellar positions and magnitudes, resulting from over 1,800,000 observations; and there are ready eighteen charts, containing 550,000 stars.

The number of meridian observations obtained is 198,000, all reduced to the mean epoch of 1900.

Now, the actual time and labour required to reduce, collect, and prepare for the press that number of Dm. observations, and to publish the results as given in our volumes, is very considerable—apart from the preparation of the atlas—being, in fact, considerably greater than that given to the Uranometry.

There remains, then, the discrepancy between the previous 265,000 observations and the present 198,000; in explanation of

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which there is this to be said: Owing to the time and expense which the revision and publication of the above eight catalogues entailed, besides the difficulty in obtaining assistance, it was not possible to begin systematic meridian work before the end of 1890, and in consequence only 28,300 observations were made previously to 1891.

From 1891 to 1901 was the period of our greatest activity, and with an average of no more than 189 working nights per year we obtained 144,151 complete observations. The average in the former period was 270, or a difference of 91 working nights per year, which, in ten years of such weather as we had and are having, amounts to 4·8 years! In other words, ten years in the former period were equal to 14·8 years at the present time. Therefore the number of observations which we assuredly would have obtained under those conditions, and which were lost solely on account of the altered climatic conditions, is 69,192.

We have then—

Number of observations previous to 1891 .	28,300
,, ,, from 1891 to 1901 .	144,150
Loss by change of climate	69,192
Number of observations since 1901 . .	30,940
Total	272,582
Gould's total	265,758

all reduced to similar conditions for the purposes of exact comparison.

From the above it should be apparent that not only the "financial disaster," which made it impossible for me ever to maintain as efficient a corps of assistants as Dr. Gould always had, but also climatic "disasters," and the additional burden of publishing the greater part of the volumes produced in that period, have been prime factors in bringing about the state of affairs which the Carnegie Commission presents to your consideration.

Surely no astronomer could wish those gentlemen anything but the most complete and abundant success in the projected enterprise, and the great need of the observatory is sufficiently indicated by the disparity in the numbers of such institutions in the two hemispheres.

Cordoba: 1904 *May* 25.

Erratum (*in some copies*)

Page 618, line 17 from bottom:

The semicolon should be placed after the word "another," and not after "lenses"; the line should therefore *read*

"less independent of one another; in these Cooke lenses, provided"